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EXAMINER	
BASS, DIRK R	

ART UNIT	PAPER NUMBER
4132	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/537,533	LIANG ET AL.	
	Examiner	Art Unit	
	DIRK BASS	4132	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-47* is/are pending in the application.

4a) Of the above claim(s) *29-47* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 June 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *18 Jan. 2006, 19, Dec. 2007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Restriction is required under 35 U.S.C. 121 and 372. This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-28, drawn to a gas chromatograph column.

Group II, claim(s) 29-30, drawn to a gas chromatograph system.

Group III, claim(s) 31-47, drawn to a method for analyzing an analyte.

2. The inventions listed as Groups I-III do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical feature, miniature gas chromatograph columns, linking groups I-III is disclosed by Goedert, US 4935040. Goedert ('040) describes a miniature gas chromatograph column formed of multiple layers having recesses in the layers for the flow of a mobile phase (see abstract). The gas chromatograph column is formed from a channel on multiple layers to provide a stationary phase (see abstract and fig. 1), thus the special technical feature of the claimed invention is not found to define a contribution over the prior art.

3. During a telephone conversation with Yan Leychkis on 20 November 2008 a provisional election was made with traverse to prosecute the invention of group I, claims 1-28. Affirmation of this election must be made by applicant in replying to this Office action. Claims 29-47 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

4. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

5. The examiner has required restriction between product and process claims. Where applicant elects claims directed to the product, and the product claims are subsequently found allowable, withdrawn process claims that depend from or otherwise require all the limitations of the allowable product claim will be considered for rejoinder. All claims directed to a nonelected process invention must require all the limitations of an allowable product claim for that process invention to be rejoined.

6. In the event of rejoinder, the requirement for restriction between the product claims and the rejoined process claims will be withdrawn, and the rejoined process claims will be fully examined for patentability in accordance with 37 CFR 1.104. Thus, to be allowable, the rejoined claims must meet all criteria for patentability including the requirements of 35 U.S.C. 101, 102, 103 and 112. Until all claims to the elected product are found allowable, an otherwise proper restriction requirement between product

claims and process claims may be maintained. Withdrawn process claims that are not commensurate in scope with an allowable product claim will not be rejoined. See MPEP § 821.04(b). Additionally, in order to retain the right to rejoinder in accordance with the above policy, applicant is advised that the process claims should be amended during prosecution to require the limitations of the product claims. **Failure to do so may result in a loss of the right to rejoinder**. Further, note that the prohibition against double patenting rejections of 35 U.S.C. 121 does not apply where the restriction requirement is withdrawn by the examiner before the patent issues. See MPEP § 804.01.

Claim Rejections - 35 USC § 112

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claim 26 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

9. Regarding claim 26, it is unclear whether said at least two capillaries are connected to each other through a hole in said channel and lid layer or whether said at least two capillaries are connected to each other through a hole in said channel or lid layer. It is unclear which situation described above applicant would like to claim. Due to the use of the and/or language, which renders the claim indefinite, it is unclear which embodiment described above applicant would like to claim.

Claim Rejections - 35 USC § 102

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. Claims 1-5, 8, 10-24, and 26-28 are rejected under 35 U.S.C. 102(b) as being anticipated by Craig, US 5792943.

12. Regarding claim 1, Craig ('943) discloses a gas chromatograph column (col. 12, l. 54 – col. 13, l. 1), which column comprises at least two lid layers (see "first portion 288a" and "third portion 288c", fig. 6a-6b) and a channel layer (see "second portion 288b", fig. 6a-6b), wherein each of said layers comprises a compact material (see "substrate material", col. 5, l. 1-8) suitable for gas chromatography (col. 12, l. 54 – col. 13, l. 1), said channel layer comprises microfabricated channels on both sides (col. 17, l. 8-11, and fig. 6a-6b) and a side of said lid layers form at least two capillaries (see "channel 260", "channel 262", fig. 6a-6b), said at least two capillaries are connected to each other through a hold in said channel layer to form an integrated capillary (see "conduit means 272", fig. 6a-6b), said integrated capillary is connected to outside atmosphere on both ends via holes on two outmost lid layers (see "first portion 288a" and "third portion 288c", fig. 6a-6b) to serve as an inlet and an outlet (see "aperture 270", "aperture 278", fig. 6a-6b).

13. Regarding claim 2, Craig ('943) discloses a gas chromatograph column which comprises more than two lid layers and more than one channel layer and an integrated

capillary is formed through all the lid and channel layers (col. 4, l. 41-47 where 'n' component sections $\geq$ 3 , and fig. 6a-6b). Where 'n' component sections $\geq$ 3, Craig ('943) teaches in figures 6a-6b and col. 4, l. 41-47 the top ('n' = 1) and bottom component ('n' = 3) sections being "lid layers" and the middle component section forming a "channel layer" ('n' = 2).

14. Regarding claim 3, Craig ('943) discloses a gas chromatograph column which comprises three lid layers and two channel layers and an integrated capillary is formed through all the lid and channel layers (col. 4, l. 41-47 where 'n' component sections $\geq$ 3, and fig. 6a-6b). Where 'n' component sections $\geq$ 3, Craig ('943) teaches in figures 6a-6b col. 4, l. 41-47 the top ('n' = 1), bottom ('n' = 5), and middle ('n'=3) component sections forming "lid layers" and the middle component sections forming "channel layers" ('n' = 2, 4).

15. Regarding claim 4, Craig ('943) discloses a gas chromatograph column wherein the compact material is metal (see "substrate material", col. 5, l. 1-8).

16. Regarding claim 5, Craig ('943) discloses a gas chromatograph column wherein the lid layers and the channel layer comprise the same compact materials (see "substrate material", col. 5, l. 1-8).

17. Regarding claim 8, Craig ('943) discloses a gas chromatograph column wherein the lid layers and the channel layer have the same or different area (fig. 6a-6b).

18. Regarding claim 10, Craig ('943) discloses a gas chromatograph column wherein the microfabricated channels have a width ranging from about 1 to about 1,000 microns (see "5 to 1000 micrometers", col. 10, l. 6-9).

19. Regarding claim 11, Craig ('943) discloses a gas chromatograph column wherein the microfabricated channels have a depth ranging from about 3 to about 500 microns (see "50-800 micrometers", col. 17, l. 49-54).

20. Regarding claim 14, Craig ('943) discloses a gas chromatograph column wherein the integrated capillary has a total length of at least 4 meters (see "path lengths of up to 15 meters", col. 17, l. 49-54).

21. Regarding claim 15, Craig ('943) discloses a gas chromatograph column wherein the integrated capillary has a semi-circular sectional shape (fig. 12).

22. Regarding claim 16, Craig ('943) discloses a gas chromatograph column wherein the cross-section of the integrated capillary has an area ranging from about 5 to about 250,000 square microns (see "50-800 micrometers", col. 17, l. 49-54). The reference teaches diameter dimensions between the range of 50 and 800 micrometers. Selecting a diameter of 50 micrometers and computing the area of a circular cross section equates to a cross-sectional area of approximately 7854 square micrometers.

23. Regarding claim 17, Craig ('943) discloses a gas chromatograph column wherein the integrated capillary has identical cross-section areas along its length (fig. 2).

24. Regarding claim 18, Craig ('943) discloses a gas chromatograph column wherein the integrated capillary has a serpentine pattern (fig. 6a).

25. Regarding claim 19, Craig ('943) discloses a gas chromatograph column wherein the wall of the integrated capillary is coated with a thin film of a stationary phase (see "surface treatment", col. 13, l. 42-54 and Example 1, col. 20, l. 33-35).

26. Regarding claim 20, Craig ('943) discloses a gas chromatograph column wherein the stationary phase is applied via a deposition method (see "surface treatment", col. 13, l. 42-54).

27. Regarding claim 21, Craig ('943) discloses a gas chromatograph column wherein the stationary phase is applied after the layers are bound together (see "surface treatment", col. 13, l. 41-46 and Example 1, col. 20, l. 33-37).

28. Regarding claim 22, Craig ('943) discloses a gas chromatograph column wherein the hole in the channel layer and the holes in the lid layers have a round shape (fig. 6a).

29. Regarding claim 23, Craig ('943) discloses a gas chromatograph column wherein the hole in the channel layer and the holes in the lid layers are formed by etching (col. 3, l. 57-67).

30. Regarding claim 24, Craig ('943) discloses a gas chromatograph column wherein the layers are bound together by heat bonding (col. 4, l. 51-64).

31. Regarding claim 26, Craig ('943) discloses a gas chromatograph column (col. 12, l. 54 – col. 13, l. 1), which column comprises at least two lid layers (see "first portion 288a" and "third portion 288c", fig. 6a-6b) and at least two channel layers (col. 4, l. 41-47 and fig. 6a-6b) wherein each of said layers comprises a compact material suitable for gas chromatography (see "substrate material", col. 5, l. 1-8), said channel layers comprises microfabricated channels on a side (col. 17, l. 8-11, and fig. 6a-6b) and a side of said lid or channel layers form at least two capillaries (see "channel 260", "channel 262", fig. 6a-6b), said at least two capillaries are connected to each other through a hold in said channel or lid layer to form an integrated capillary (see "conduit

means 272", fig. 6a-6b), said integrated capillary is connected to outside atmosphere on both ends via holes on two outmost lid layers (see "first portion 288a" and "third portion 288c", fig. 6a-6b) to serve as an inlet and an outlet (see "aperture 270", "aperture 278", fig. 6a-6b).

32. Regarding claim 27, Craig ('943) discloses a gas chromatograph column wherein at least one of the channel layers comprises microfabricated channels on one side and the other side of the same channel layer directly faces microfabricated channels of another channel layer to form a capillary (see col. 4, l. 41-47, fig. 6a-6b).

33. Regarding claim 28, Craig ('943) discloses a gas chromatograph column wherein at least one of the channel layers comprises microfabricated channels on both sides and said microfabricated channels and a side of the lid layers form at least two capillaries (see col. 4, l. 41-47, fig. 6a-6b).

Claim Rejections - 35 USC § 103

34. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

35. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

36. Claims 6-7, 9, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Craig, US 5792943 in view of Goedert, US 4935040.

37. Regarding claims 6-7, and 9 Craig ('943) is relied upon in the rejection of claim 1 above.

38. Craig ('943) further teaches miniaturization of gas chromatograph columns being advantageous due to reduced production costs, decreased instrument sizing, and increased speed of analysis (col. 1, l. 14-22).

39. Regarding claims 6-7, Craig ('943) fails to disclose a gas chromatograph column wherein the lid layers and the channel layers have an area ranging from about 1 to about 100 cm^2.

40. Regarding claim 9, Craig ('943) fails to disclose a gas chromatograph column wherein the lid layers and the channel layer have a thickness ranging from about 0.1 to about 5mm.

41. Goedert ('040) discloses a gas chromatography column wherein the lid layers and channel layers (see "structure 14" and "wafer group 39" , fig. 1) have an area ranging from about 1 to about 100 cm^2 (see "5cm x 5cm", col. 4, l. 41-43) and a thickness ranging from about 0.1 to about 5mm (see "6mm", col. 4, l. 41-43) to simplify manufacturability of parts and to reduce further size, weight, and electrical consumption of instruments utilizing miniaturized gas chromatograph columns (col. 1, l. 67—col. 2, l. 5). It is construed by the examiner that "6mm" can reasonably be within the range of

"about 5mm" due to an increase of thickness (20%) being less than a degree of magnitude from the claimed range of "about 5mm".

42. At the time of the invention, it would have been obvious to one skilled in the art to combine the teachings of Craig ('943) and Goedert ('040) to simplify manufacturability of parts and to reduce further size, weight, and electrical consumption of instruments utilizing miniaturized gas chromatograph columns

43. Regarding claim 25, Craig ('943) is relied upon in the rejection of claim 1 above.

44. Craig ('943) fails to disclose a gas chromatograph column further comprising a heater wire deposited on an outside surface of the integrated capillary to provide for electric heating of a stationary phase material within the integrated capillary during operation of a gas chromatograph.

45. Goedert ('040) discloses a heater wire (see "column heater #1", fig. 1 and "hot wire resistive element 166", fig. 9) deposited on an outside surface of the integrated capillary to provide for electric heating of a stationary phase material within the integrated capillary during operation of a gas chromatograph (col. 7, l. 40-52) in order to provide a heating apparatus that is electrically controlled for selective heating of a stationary phase material within the integrated capillary (col. 8, l. 26-28).

46. At the time of the invention, it would have been obvious to one skilled in the art to combine the teachings of Craig ('943) and Goedert ('040) in order to provide a heating wire that is electrically controlled for selective heating of a stationary phase material within the integrated capillary.

47. Claims 12-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Craig, US 5792943 in view of Swedbert et al., US 6240790.

48. Regarding claims 12-13, Craig ('943) is relied upon in the rejection of claim 1 above.

49. Craig ('943) further discloses a gas chromatograph column wherein the microfabricated channels are formed by an etching method (col. 3, l. 57-60).

50. Craig ('943) fails to disclose a gas chromatograph column wherein the microfabricated channels are formed by a wet or dry etching method.

51. Swedberg ('790) teaches a gas chromatograph column wherein the microfabricated channels are formed by a wet or dry etching method (see col. 3, l. 53-56 and col. 7, l. 41-45) in order to have desired miniaturized surface features (col. 3, l. 53-56).

52. At the time of the invention, it would have been obvious to one skilled in the art to combine the teachings of Craig ('943) and Swedberg ('790) in order to have desired miniaturized surface features in the gas chromatograph column.

Conclusion

53. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DIRK BASS whose telephone number is (571)270-7370. The examiner can normally be reached on Monday - Thursday 10am-4pm.

54. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, MIKE LAVILLA can be reached on 5712721539. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

55. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DRB/
Dirk R. Bass
24 November 2008

/Alicia Chevalier/
Primary Examiner, Art Unit 1794